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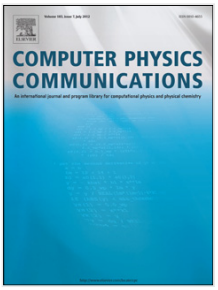

Motion of a charged particle in an axisymmetric longitudinal magnetic field that is inversely proportional to the radius

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Motion of a charged particle in an axisymmetric longitudinal magnetic field that is inversely proportional to the radius

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Abstract

An exact solution to the equations of motion of a charged particle in an axisymmetric magnetic field inversely proportional to the distance from the axis of symmetry is described and a FORTRAN code computing this solution is provided. This solution involves only elementary mathematical functions, however, it requires finding a root of a transcendental equation numerically. Although not particularly complicated in principle, this process is tedious in implementation as it requires considering several distinct types of solutions determined by the initial conditions as well as developing procedures for selecting the correct branches of the inverse trigonometric functions at multiple turning points. While this exact solution has been mentioned in the literature, its detailed description has been lacking.

Keywords: particle orbit theory, magnetic field, exact solution

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